Erosion, Sediment and Stormwater Runoff Control

The major problem associated with erosion on a construction site is the movement of soil off the site and its consequent pollution of receiving rivers, streams and lakes. In Missouri 70 to 90 percent of the eroded soil (sediment) that reaches any type of channel is transported to the state's water resources.

Types of Erosion

Erosion is a natural process which loosens and removes the soil. On a construction site, the erosion process is accelerated because the soil is left bare and unprotected by vegetation. There are five types of erosion (shown in Figure 2.1) described below and ranked from least severe to most severe. Splash and sheet erosion can best be prevented by protecting the land surface with vegetation, mulch or erosion control blankets. Sheet, rill and gully erosion can be controlled by keeping runoff velocities slow.

Splash

Splash erosion results from the direct impact of falling drops of rain on soil particles. This impact breaks the bonds between the particles, dislodges them and splashes them into the air. The dislodged soil particles can then be easily transported by the flow of surface water runoff.

Sheet

Sheet erosion is the removal of a thin layer of exposed surface soil by the action of raindrop splash and runoff. The water moves in broad sheets over the land, picks up these particles and carries them along as it flows downhill.

Rill

As the runoff moves down a slope, it cuts small paths or rills. In rill erosion, water flowing through these paths detaches more soil from their sides and bottoms.

Gully

Further down the slope, water tends to concentrate in channels and pick up speed. In gully erosion, soil is removed rapidly by water gushing over the headcut or uphill end of the gully, by concentrated flow scouring the sides and bottom of the gully and by water removing soils that have slumped from the sidewalls of the gully. A nearly vertical headcut allows water falling over the surface to undermine the bank so that the gully moves upslope. Large earthmoving equipment is required to reshape or control gullies.

Stream and Channel Increases in the volume, velocity and time of runoff may cause erosion of the receiving stream or channel banks and bottom.

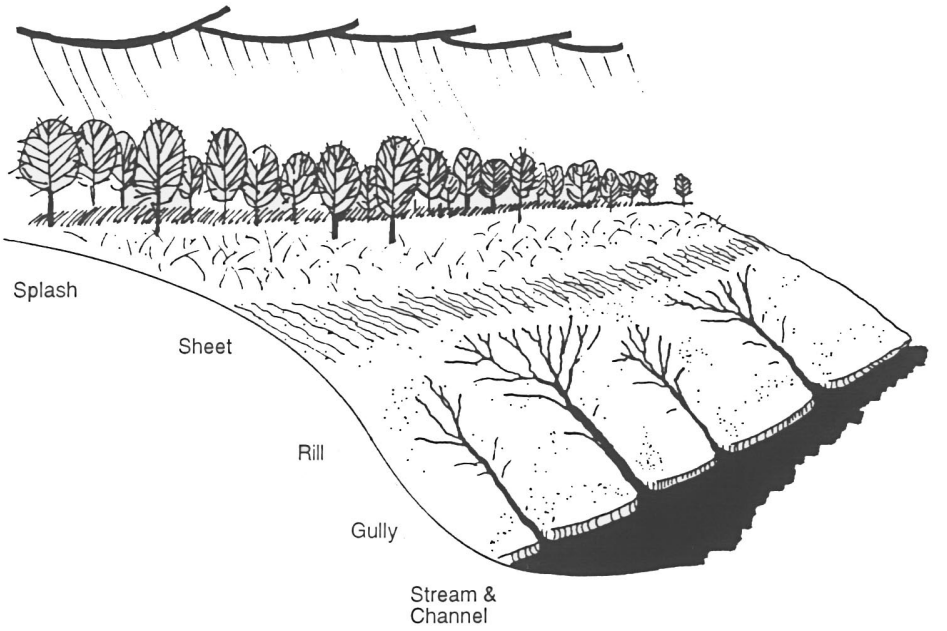

Figure 2.1 The Five Types of Soil Erosion on an Exposed Slope

Source: North Carolina DEHNR, 1993

Factors that Influence Water Erosion

The potential for a land area to erode is determined by several key factors: climate, rainfall, soil erodibility, and the length and steepness of the slope. These factors are interrelated in their effect on the potential for erosion. The variability in terrain and soils makes erosion control unique to each development site.

A site specific soils analysis and the assistance of a registered design professional (see *Glossary*) can aid in the development of an effective erosion, sediment and stormwater control plan.

Control Principles

The contractor can control erosion and sedimentation most effectively by protecting the soil surface from the erosive force of rain, surface water runoff and, in some cases, wind. Eroded soil must be captured and retained on the construction site. In addition, it is important to keep stormwater runoff at low velocities and volumes on site, and at or below pre-development levels going off-site. Ideally, no sediment is to leave the perimeter of the site. Reasonably, of course, some minimal, acceptable amount of sediment will leave the site. The following principles will help control erosion on the construction site and prevent off-site sedimentation and the resulting water pollution.

Protect the Land Surface

Schedule and limit grading activities to minimize bare soil areas and the time of exposure. Establish vegetation on graded areas as quickly as possible or whenever work is interrupted. Use diversions and perimeter protection to intercept runoff and divert it away from bare soil slopes. Install these practices before clearing and grading or as soon as possible. Stabilize the construction entrance and channels immediately.

Keep Runoff Velocities Low

Preserve natural vegetation where possible; mulch and vegetate exposed areas immediately after grading to allow infiltration and slow surface runoff. Use practices that shorten or "break" the slopes to reduce flow volumes and velocities. Convey stormwater runoff away from steep slopes to stable outlets and detain water in holding ponds before leaving the site.

Capture Sediment on the Site

Sediment traps, basins and barriers are designed to reduce runoff velocity, not filter it; allowing the water to pool and the sediment to settle out. Several sediment traps or barriers located at the border of a graded area are more effective than a single large sediment basin near the site boundary. These practices also reduce the volume and velocity of stormwater runoff.

Schedule Land Grading

The contractor can control erosion and sedimentation most effectively by coordinating the grading sequence and the installation of erosion and sediment control practices. Install key sediment control practices before site grading begins. Schedule or limit grading to small areas. Install the permanent stormwater drains early in the construction and protect all inlets from sedimentation.

Maintain Installed Practices

Inspection and maintenance are vital to the success of erosion and sediment control practices. Lack of maintenance is the cause of most failures. Failures of installed practices can deliver large amounts of polluted water runoff into streams and lakes. A large structure which fails, such as a detention basin, may be hazardous or damaging to people and property; just as low points in a dike can cause major gullies to form on a fill slope. Assign an individual to be responsible for routine checks, repairs and maintenance of erosion, sediment and stormwater control practices.